other electrolytic products are obtained are briefly described by Dr. Borchers in his interesting paper.

WE have received from Dr. L. Carnera, Voluntary Assistant at the Royal Observatory of Turin, a discussion of the amount of bright sunshine recorded at that Observatory, showing *inter alia* the mean duration of sunshine during the different hours and months of the years 1896–8, together with a comparison with the means obtained in a discussion by Dr. Rizzo of the values of the previous six years. While the variations between the two series show that the period is much too short for the deduction of trustworthy means, the results are valuable owing to the comparative rarity of this important climatic factor; for although observations of barometric pressure, temperature, &c., have been made at that institution for more than a century, a sunshine recorder has only been in use there for the last ten years. In fact, the instrument has only come into general use during the last twenty years, principally owing to improvements made by Sir G. G. Stokes in a recorder devised some years previously by the late Mr. J. F. Campbell.

THE Government Astronomer of Western Australia has sent us a copy of the meteorological observations made at the Perth Observatory and other places in that colony during the year 1898. This is the second of a series of annual publications issued by the Perth Observatory; annual meteorological reports have been published since 1876, but the new series shows a marked improvement. In past years the observers were dependent solely upon written instructions without inspection, and had to find out how to do their duties as best they could. In addition to the usual observations, a set of four Platinum Resistance thermometers have been sunk to various depths at Perth, and daily weather forecasts are now issued, which, on the whole, have been remarkably successful. In the year 1898 there were 31 stations provided with barometers and other instruments, and 213 rain-gauge stations, but the monthly charts show that large tracts are still unrepresented.

THE U.S. Government is pushing on its researches of the economical resources of Porto Rico. *Bulletin* No. 25 of the U.S. Department of Agriculture (Division of Forestry) consists of a report by Mr. Robert F. Hill, of the U.S. Geological Survey, on the forest conditions of the island. He states that the climate and soil are well adapted to the growth of a large number of trees and shrubs of great economical value, and he advocates a reversal of the deforesting policy pursued by the Spaniards. Besides those valuable for timber and constructing purposes, he names, as specially adapted to the climatal conditions, the tamarind, the papaw, the castor-oil plant or "palma Christi," the all-spice, the lime, a large number of edible fruits, as the orange, citron, lemon, guava, anona, mango, banana, and many others whose names are less known in this country. The coffee cultivated is of a superior quality. There are comparatively few harmful animals or poisonous plants.

PROF. W. B. SCOTT (*Trans.* Wagner Free Inst. of Science Philadelphia, vol. vi.) describes and figures a series of Ungulate Mammals from the Uinta and White River formations (Oligocene) of Utah and Colorado in North America. The mammals belong to the sub-order of "Selenodont Artiodactyls," and they include two groups; the first comprises forms generically identical with, or clearly related to, Old World anthracotheres and true ruminants, which reached the American continent by migration; the second group includes forms indigenous to America, the successive stages of whose descent may be traced through several of the Tertiary formations.

THE ninth volume of the Iowa Geological Survey (1899) contains the Annual Report for 1898, with accompanying papers. Statistics of mineral productions, including coal, clay, stone, lead and zinc, are contributed by Mr. S. W. Beyer. There are also reports on the Counties of Caroll, Humbolt, Story, Muscatine, and Scott, accompanied by colour-printed maps, and followed by an account of the Artesian Wells of the Belle Plaine Area. The county reports contain concise accounts of the various formations including Silurian, Devonian, Carboniferous, Cretaceous, Pliocene, Glacial and more recent deposits, together with notes on their economic products. In Muscatine county the Devonian rocks afford many points of special interest, and they have yielded a number of fossils.

THE *Mittheilungen* of the Vienna Geographical Society contains an excellent abstract of a paper by Dr. Eduard Richter, published by the Swiss Geological Society at the end of last year, on the advance and retreat of the glaciers in the Alps during the Ice Age. Dr. Richter arrives at the important result that the variation of climate was probably much smaller than has been supposed, because the resistance to the outflow of the ice increases with its quantity in a rapid ratio, and the level of the snowfields would therefore rise quickly to levels where the temperature was lower. The variations of level due to this cause would themselves give rise to sudden and irregular changes in the glaciers according as the ice-surface rose above, or fell below, the snow-line. They also account for the enormous amount of moraine detritus carried by these glaciers; each was made up of a large number of small ice-streams, and the debris was not carried as a ground moraine, but in the body of the ice.

THE *Biologisches Centralbatt* for November 1 contains an article by Dr. L. Kathariner on the influence of light on the colours of the pupæ of butterflies, in which many interesting points are recorded.

THE following lectures will be delivered at the Royal Victoria Hall, Waterloo Road, S.E., on Tuesday evenings during January:—January 2: "Chronicles of a Clay Cliff," by W. H. Shrubsole; January 9: "A Peep Behind the Scenes," by Metcalfe Wood; January 16: "Birds at Home and Abroad," by Mrs. Lemon; January 23: "Plants of Long Ago," by A. C. Seward, Esq., F.R.S.; January 30: "The Fathers of Geology," by F. W. Rudler.

THE *Journal* of the Franklin Institute for December contains several additional addresses delivered on the occasion of the recent celebration of the seventy-fifth anniversary of the Institute. Dr. C. F. Himes describes the history of photographic discovery from the time of Daguerre and Niépce; Mr. C. Kirchhoff surveys the achievements in mining and metallurgy during the past three-quarters of a century; and Mr. J. Fritz gives some reminiscences of the development of iron manufacture in the United States in the same period.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JANUARY, 1900.

January 2–3.	Epoch of January meteors (radiant 230° + 53°).
3.	4h. Venus in conjunction with the moon (Venus 6° S.).
6.	7h. 12m. to 8h. 10m. Occultation of 19 Piscium (mag. 5·2) by the moon.
8.	17h. 32m. Jupiter's Sat. IV. in conjunction N. of planet.
10.	7h. 1m. to 7h. 59m. Occultation of τ^2 Arietis (mag. 5·2) by the moon.
10.	7h. 55m. to 9h. 1m. Occultation of 65 Arietis (mag. 5·6) by the moon.
11.	10h. 27m. to 11h. 34m. Occultation of κ^1 Tauri (mag. 4·6) by the moon.
11.	10h. 40m. to 11h. 23m. Occultation of κ^2 Tauri (mag. 5·5) by the moon.

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January	13.	10h. 1m. Minimum of Algol (β Persei).
	15.	Venus. Illuminated portion of disc = 0·873.
	16.	6h. 50m. Minimum of Algol (β Persei).
	16.	17h. 17m. to 17h. 50m. Occultation of α Cancri (mag. 4·3) by the moon.
	20	12h. 46m. to 13h. 46m. Occultation of B.A.C. 4006 (mag. 5·7) by the moon.
	21.	11h. 22m. to 12h. 26m. Occultation of q Virginis (mag. 5·7) by the moon.
	23.	15h 35m. to 16h. 45m. Occultation of B.A.C. 4722 (mag. 5·5).
	26.	1h. Conjunction of Jupiter and the moon (Jupiter 2° 3′ N.).
	26.	15h 40m. Transit of Jupiter's Sat. III. (Egress).

ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.—Prof. E. B. Frost, of the Yerkes Observatory, contributes to *Science* a full account of the proceedings at the first meeting of this new society, which is the permanent outcome of the two congresses of astronomers and astrophysicists held in the past two years. The following notes are from the report:—

Prof. S. J. Brown discussed his measures of the changes in the orbit of the satellite of Neptune, in order to determine the position of the polar axis and flattening of the planet. This flattening is found to be $\epsilon = \frac{1}{102{\cdot}2}$, an amount corresponding to only $0''{\cdot}03$ between the polar and equatorial diameters.

The period of the revolution of the pole of the satellite's orbit is 531·75 years.

Prof. A. S. Flint described the new Repsold transit micrometer of the Washburn Observatory.

Mr. Kurt Laves read a paper on the "Determination of the constant of nutation from heliometer measures of Eros." The opposition of this planet at the end of 1900 will offer special facilities for this purpose.

An account was given of a proposed new "Harvard Photometry." In the original work all stars were included of sixth or brighter magnitude, as obtained from the principal catalogues then extant; but it has been found in the course of the work that in this way many have been included which are fainter than mag. 6·2. The stars of the Photometry were again observed in 1892–94, and, including special series of measures, there are now prepared *seven* photometric catalogues, giving measures by different observers with different instruments, but all made on the same plan. It is therefore proposed to issue a catalogue of all the stars from the north to the south pole, showing the brightness given by the meridian photometer in all seven catalogues, and to call the work the "Revised Harvard Photometry." As much reference information to other catalogues will be given as is possible, and it is thought a quantitative measure of the colour will be furnished by giving the type of spectrum and photographic magnitude.

Prof. G. C. Comstock described his experiments of placing a very coarse grating before the object glass of a telescope, and measuring the distance between the mean centres of the pairs of star spectra formed on each side of the central image. He finds incidentally that the mean refrangibility of the light of Mars is marked by *less* than that of any red stars yet examined. He has also examined the satellites of Jupiter in this way, and finds different values from those adopted by Michelson and Hamy.

Mr. F. L. Chase has taken heliometer observations of red stars, &c., in order to determine the possibility of there being a slight difference of refraction between these and white stars, thus introducing a disturbing element into measures of parallax. In all his experience, however, he was unable to detect any difference whatever.

Prof. S. I. Bailey said that out of the 900 stars counted in the cluster M. 5., eighty-five were variable. Detailed examination of the light curves and periods of many of them showed a remarkable similarity both in the magnitude and range of variation. The periods vary from 10h. 48m. to 14h. 59m. The uniformity of period, magnitude, and light curve among so many variables, points to a common origin and cause of variability.

DAY NUMBERS OF "NAUTICAL ALMANAC."—We have received a pamphlet giving the separate day numbers for use with the tables for finding star constants for the years 1900, 1901, 1902. From the past three years' experience, Prof. Turner says that his restriction of the tables to three figures has been followed by no loss of accuracy, and therefore their publication is continued. In accordance with the decisions of the Conference of Superintendents of Ephemerides held at Paris in 1896, the constants of aberration, precession, and nutation have been altered from the commencement of 1901; but, for the convenience of observers still desiring to use the Struve-Peter's constants, both have been included in the present tables.

"POPULAR ASTRONOMY" FOR DECEMBER.—The issue of *Popular Astronomy* for this month contains, among much generally interesting matter, two useful articles by Profs. H. C. Wilson and W. H. Pickering. The former describes a photograph of the nebula of Andromeda obtained by him at Goodsell Observatory, using the 8-inch Clarke refractor, with an exposure of twelve hours given on three nights. Reproductions of the picture accompany the paper, and the minute structure of the many spirals first photographed by Roberts are magnificently shown.

Prof. Pickering writes to keep up hopes of the meteor shower still being observable. He has examined the times of appearance of the maximum from 902 more minutely, and finds they occurred at regular 100 years' intervals until 1698, when there was a perturbation of four years. Since then thirty-four years would appear to more closely satisfy the period, so that 1901–2 may still be the maximum year.

THE SOUTH-WESTERN POLYTECHNIC.

ONE of the best equipped and most intelligently governed of the London polytechnics is that built at a cost of 55,000*l.*, and located at Manresa Road, Chelsea. Situated as it is in the midst of a densely-populated district, its work, which a large staff of lecturers and demonstrators, under the able guidance of Prof. H. Tomlinson, F.R.S., the Principal, are year by year steadily accomplishing, cannot be overestimated. The work of the polytechnic is carried on in a fine suite of buildings placed within a stone's throw of the Chelsea Town Hall, and the institution is provided with laboratories and lecture-rooms for each of the many departments of science and technology which its work comprises. It is designed more especially to meet the educational needs of the inhabitants of Chelsea, Fulham, Kensington, St. George's (Hanover Square), and Westminster, though students from other parishes are admitted if accommodation is available and other circumstances permit.

Financial Position.—The financial outlook of the South-Western Polytechnic may certainly be regarded as hopeful. Both the fees received from the students and members and the grants earned last session from the Science and Art Department showed a very large increase. The total annual income received from the Technical Education Board of the London County Council amounts to over 4000*l.*, and the annual subsidy from the Charity Commissioners is 1500*l.* The inadequate accommodation which the already extensive buildings offer the increasing number of students to be provided for, has necessitated a further extension, and the governing body are now spending some 7000*l.* on new buildings.

Departments.—The operations of the institution are divided into two distinct portions—day classes and evening classes. In the day classes are included (1) a Day College for men; (2) a Day College for women; (3) a School of Art; (4) a School of Science for boys and girls; and (5) a School of Domestic Economy for girls. The evening classes embrace the following sections: (1) Mathematics; (2) Physics and Electrical Engineering; (3) Mechanical Engineering and Building Trades; (4) Chemistry; (5) Natural Sciences; (6) Languages; (7) Commerce; (8) Domestic Economy; (9) Art; (10) Music; (11) Miscellaneous; (12) Recreation.

Numbers of Students.—The most notable fact, and one of the most encouraging features of the work of the South-Western Polytechnic, is the regular and substantial increase from year to year in the numbers of students attending the different departments. The number of students in the day classes during the session 1897–8 was nearly half as many again as that during 1896–7. Taking all the day classes for both sexes together, the number of individuals attending during the present session is about 30 per cent. greater than for the last school year, the number undergoing instruction at the present time being about 900.

The number of individual students in all evening classes together is about 2000 for the current session, during 1897–8 it

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